

## CONTEXT MANAGEMENT SERVER APPLIANCE

## BACKGROUND OF THE INVENTION

## CROSS-REFERENCE TO RELATED APPLICATIONS

The present application claims domestic priority under 35 U.S.C. §119(e) to U.S. Patent Application Serial No. 60/136,670, filed May 28, 1999, and to U.S. Patent Application Serial No. 60/139,235, filed June 14, 1999, both of which are incorporated herein by reference. The subject matter disclosed herein is also related to the subject matter of U.S. Patent Application Serial No. 09/545,396, filed April 7, 2000, also incorporated herein by reference.

## FIELD OF THE INVENTION

The present invention relates to context management systems. More particularly, the invention relates to systems in which context management software is configured as a server. Yet more particularly, the invention relates to a server appliance including a standalone computer and software system, which performs context management over a network. In some aspects, the invention relates to such a server appliance, which is applicable to context management of healthcare applications.

## RELATED ART

There are many businesses or fields of endeavor, which rely on the use of plural desktop computer applications. One such field is the modern practice of medicine. In such a setting, users quite often find themselves entering and reentering similar information over and over. For example, a single user may have to repeat login information in plural applications, followed by the same or similar client information. Such information that defines the environment in which each application operates is known as context. That is, context is a collection of data items and corresponding values, wherein the items represent information required in common between plural applications in an industry or business setting. For example, in health care, a patient identifier (patient ID) is an item which is part of the context in which plural clinical applications may participate, or share.

In the modern practice of medicine, a physician or other professional or staff member may need to store, retrieve, analyze, etc. various types of patient data. The patient data to be processed may be clinical; e.g. x-ray images or blood work results, or may be financial, e.g. insurance cover and billing history. Thus, clinical applications, such as those to store, retrieve and display x-ray images and those to store, retrieve and display blood work results have inputs and outputs which fall into two broad classes: highly specialized, work product specific I/O; and more general, context-related I/O.

The desirability of managing context information, so that a user at a workstation need not reenter information such as user identification (user ID) or patient identification (patient ID) has long been recognized.

A standard known as Health Level Seven Context Management Specification Version CM-1.1 was promulgated by the Health Level Seven (HL7) Clinical Context Object Workgroup (CCOW) on November 6, 1999, incorporated herein in its entirety by reference, to define an interface and other architectural definitions of a Context Management Architecture (CMA), whereby clinical applications interact with a Context Manager to manage context information across a range of clinical and other health care related applications.

At this time, there is no other known, comprehensive context management software packages available. Some small steps have been taken for example to share context amongst one publisher's own titles, using proprietary methods absent a context manager, or to permit a user to sign onto a single application which transfers user context to plural other applications. However, no context manager handling both user and patient context is known, much less a complete system with central administration of the context management process.

A context management administrator is described in detail in U.S. Patent Application Serial No. 09/545,396, referred to above.

Context managers and context management administration software require communication from a user via a user interface. Conventional context managers and context management administrators therefore require a console or monitor and keyboard connected to the computer system on which they execute, in order for the user to communicate therewith. A context management administrator may communicate

directly with one or more context managers residing on the same computer system. Alternatively, they may communicate through a network.

Likewise a context manager may execute on a computer system in common with the applications whose context is managed, or may execute on a remote computer system, communicating with the applications over a network.

A server appliance is a relatively new type of computing device. The server appliance is a network-connected server that provides a service to multiple client computers. A client requests the server to perform a specific task, such as returning a response to a database query. The server performs the task and returns the result of having performed the task back to the client.

However, unlike traditional computing servers that provide general-purpose platforms for a wide range of computing tasks, a server appliance is singular in purpose. A server appliance contains specialized software, and possibly specialized hardware, as well, to enable it to achieve its specialized purpose. Server appliances can therefore be optimized for the specific tasks that they may be designed to perform, thereby reducing the server cost and complexity as compared to the cost and complexity of general-purpose servers.

Conventional commercially available server appliances include print server appliances, whose only function is to queue print jobs and route them to appropriate printers; web server appliances, whose only function is to host a single web site or small group of web sites; electronic mail server appliances, whose only function is to host electronic mail services; and, file server appliances, whose only function is to centrally store and retrieve computer files.

The computing hardware on which server appliances are built conventionally includes a central processing unit, memory and long term data storage, all packaged within a single unit. The unit conventionally has only a power supply input and a network input/output (I/O) port. The network I/O port may connect the server appliance to a computer network using any conventional networking hardware, including but not limited to a modem connection, an Ethernet connection, a universal serial bus (USB) connection, etc.

The user controls on a server appliance are conventionally very simple. There may be no controls at all, only a power connection and a network connection, as noted above. Alternatively, there may simply be an on/off switch.

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#### SUMMARY OF THE INVENTION

The present invention overcomes problems with the conventional approaches to hosting context management and context management administration software by providing, according to various aspects and embodiments thereof, a turnkey system  
10 providing context management through a network. Embodiments of the invention can bootstrap themselves into operation after only being connected to a power supply and network.

One embodiment of the invention in a context management server appliance includes a computer system and memory executing a stored set of instruction. The  
15 computer system has a power supply input and a network input/output (I/O) port. The memory includes a memory in which is stored a set of instructions defining a context management server which delivers context management information to client applications and a memory in which is stored a set of instructions defining a software interface for administering the context management server over the network using a  
20 general-purpose client interface. According to another embodiment of the invention, the context management server appliance further includes a memory in which is stored configuration information for the context management server, whereby the context management server can bootstrap without requiring user intervention. When such an embodiment can bootstrap independently of user intervention, there may also be a  
25 memory in which is stored a set of instructions which when executed connect the server appliance to the network absent user intervention. According to another embodiment of the context management server appliance there may be included a memory in which is stored a set of instructions which when executed balance a processing load on the server appliance with a processing load on another server appliance. According to yet another  
30 embodiment of the invention, the context management server appliance includes a memory in which is stored a set of instructions which when executed transfers a processing load from a failed server appliance to another server appliance.

Some embodiments of the invention may use servers, which communicate using a standard protocol such as the Hypertext Transport Protocol used in the World Wide Web of the global computer network, the Internet. In such an embodiment, applications can access the context management server through a World Wide Web universal  
5 resource locator (URL) on the global Internet. Such a URL need not provide access by a user of a conventional browser client to any information, but may be accessible only to application programs whose context are managed. The protection may use user ID and password, encryption and other trusted transaction systems known in the art.

#### BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings, in which like reference designations indicate like elements:

Fig. 1 is a block diagram of a system of context management applications and the context manager operating through a network;

Fig. 2 is a block diagram of one embodiment of a context management server  
15 appliance;

Fig. 3 is a block diagram of another embodiment of the invention constructed using two server appliances; and

Fig. 4 is a block diagram of yet another embodiment of the invention with built in load sharing and fault tolerant features.

#### DETAILED DESCRIPTION

The invention will be better understood upon reading the following detailed description of some embodiments and aspects thereof in connection with the figures.

In accordance with some embodiments of the invention, a software agent acting  
25 on behalf of the user, referred to as a *Context Manager* (CM), enables applications to establish and maintain a common context on behalf of a user. The context may be organized in a variety of ways. For example, in the healthcare industry, the Health Level Seven Context Management Standard represents clinical context as a set of context subjects. Each subject represents a real-world entity, such as a patient or clinical  
30 provider, or a real-world concept, such as a clinical encounter, order, or disease state. Context management is explained in some detail in U.S. Patent Application Serial No. 09/545,396, noted above.

When a user performs a relevant application gesture, such as selecting a patient from a list of patients, the application informs the context manager of this fact. The context manager is then responsible for conveying to the other applications that a patient has been selected. Information that identifies the patient is conveyed via the context manager. All of the applications in use then tune their data displays to the selected patient.

In accordance with one aspect of the invention, shown in Fig. 1, the CM resides and executes on a computer, for example web server 102, separate from the application 103 managed. The applications send information to and receive information from the CM through the World Wide Web 104 over the global Internet 105. Communication is effected using conventional protocols such as TCP/IP and HTTP, as needed.

The Web server 102 shown may be distributed over one or more computers providing the functions of the CM 101 and a context vault 106 providing passcode services and a user-mapping agent (UMA). These functions are all described in detail in U.S. Patent Application Serial No. 09/545,396, noted above.

A World Wide Web server provides the only application interface needed for the applications to access the CM and the supporting Context Vaults.

In accordance with another aspect of the invention, as shown in Fig. 2, the context manager 101 resides on the server appliance 201, but tracks and maintains a user's context as established by the user upon a particular computer running an application 103. A single context manager 101 may service one, or several, computers and applications. However, each computer perceives that it is interacting with a single context manager 101.

A network connection 202 between each user's computer and the server appliance enables the necessary communication. The network which the server appliance of Fig. 2 is connected to may be the global Internet, for example, or another wide area or local area network. In addition to the context manager 101, the server appliance 201 may contain additional service modules that support the context manager in performing its tasks. As shown in Fig. 2, the appliance may provide the CM 101 and Context Vault 106 functions.

The physical controls for a server appliance are generally limited in nature, and in the simplest case may consist only of an on-off switch. A power connection 203 and a

network connection 204 complete this simplest of physical configurations. Devoid of a keyboard, mouse, and other traditional user-interface devices, any interaction with the appliance for the purposes of installation, configuration or maintenance is effected via remote applications that communicate with the appliance through its network connection, for example using conventional browser 205 client software. In such a configuration, the browser 205 would be directed to a particular location 206 in the Web site supported by the appliance, at which a configuration program can be accessed and controlled through an interface displayed by the browser 205 in response to messages from the configuration program 206.

The context management server appliance can be implemented in a variety of ways. One way is to adapt an existing server appliance device by creating and installing the necessary context management software and complementary support tools. The network connection to the Internet would be based upon the TCP/IP protocol upon which a higher-level communication protocol such as HTTP might be used, as mentioned above.

The specific network messages that pertain to context management can be represented in a variety of ways. One example is to define messages using the syntax of HTTP, such that each message represents a specific action for the server to process. For example, an application might send a specific message when it wants to change the data for the current context. It would send a different message if it wanted to obtain the data for the current context.

The functionality of context management can be partitioned, according to another aspect of the invention shown in Fig. 3. In this exemplary partitioning, the CM and Context Vault are each configured to execute on their own server appliance 301 and 302, respectively. The server appliances 301, 302 then communicate with each other through the network 202 to which they are connected. Applications 103 whose context is managed communicate with the CM using TCP/IP and HTTP, for example, as before.

As shown in Fig. 4, plural manager appliances can be connected to the network. When an application addresses a context manager, the communication may be mediated by a service which ensures that the work load of the plurality of context managers is fairly distributed. The load sharing service itself may be distributed amongst the various context managers which communicate with each other and with the managed

applications through the network. When a context manager fails or is taken off line for service, the same or a similar service can ensure that context management tasks are suitably redistributed amongst the remaining context management server appliances.

5 Server appliances embodying aspects of the invention do not merely serve back to the managed applications stored data or simply process input messages. These server appliances perform all of the complex CM functions described in U.S. Patent Application Serial No. 09/545,396, as well as serving the result of that activity to the managed applications.

10 This invention has been motivated by the application of context management to healthcare. However, context management, and therefore a context management server appliance, can be applied to many industries, and as such this invention is not limited to healthcare.

15 A network connection between each user's computer and the server appliance, and/or between other general-purpose servers and the server appliance, enables the necessary communication. In addition, the server appliance may contain additional modules that enable the server to be remotely configured and supported.

In the healthcare field, the use of a server appliance for hosting the services relating to maintaining a Master Patient Index, and for hosting services relating to Coding data, is particularly unique.

20 In general, a Master Patient Index (MPI) implements an application service wherein the myriad of identifiers typically assigned by a healthcare organization to represent each person known to the organization are reconciled. This reconciliation enables the unambiguous correlation of information about a person who is represented by different identifiers in different electronic and paper systems. An MPI typically  
25 maintains additional descriptive information about each person. This information, usually referred to as demographics data, includes the person's full name, address, telephone number, etc.

There are currently many MPI software products, each implementing various algorithms for correlating person identifiers. However, these products are all deployed  
30 on general-purpose servers. In embodiments of this invention, the MPI is deployed within a server appliance, thereby providing an optimized, cost-effective, easier-to-maintain, information utility for the healthcare enterprise.



Another type of healthcare server appliance is a Coding server appliance. In general, coding involves the representation of data or concepts as a numeric value, even if the data or concept is not numeric in nature. The numeric representation enables the data or concept to be annotated in terms of its semantic meaning. This enables the electronic interpretation of meaning and facilitates electronically computed deductions, rules, constraints, and comparisons.

For example, the healthcare industry has defined a variety of schemes for representing medications using coded values. This enables physicians to precisely indicate (either manually or electronically) the particular medication issued, independent of the medication's trade name. Once the coded value is entered, systems can check whether the medication has been appropriately administered, determine how much to charge to the patient's bill, etc.

There are currently many Coding software products, each implementing various algorithms for annotating data with coded values. However, these products are all deployed on general-purpose servers. In this invention, the Coding is deployed within a server appliance, thereby providing an optimized, cost-effective, easier-to-maintain, information utility for the healthcare enterprise.

Embodiments of a healthcare MPI or Coding server appliance can be implemented in a variety of ways. One way is to adapt an existing server appliance device by creating and installing the necessary software and complementary support tools. The network connection is most likely based upon the TCP/IP protocol upon which a higher-level communication protocol such as HTTP might be used.

The specific network messages that pertain to context management can be represented in a variety of ways. One example is to define messages using the syntax of HTTP, such that each message represents a specific action for the server to process. For example, an application might send a specific message to an MPI server appliance when it wants to determine if two identifiers represent the same person. It would send a different message if it wanted to obtain demographics data for a person.

The invention has been illustrated by the foregoing description of a number of aspects and embodiments thereof. Numerous variations contemplated as within the scope and spirit of the invention should now be apparent to those skilled in the art. The

invention should therefore not be limited by the foregoing description, but rather by the properly construed claims, which follow.